

CALIFORNIA DIVISION OF MINES AND GEOLOGY  
FAULT EVALUATION REPORT FER-230  
**SUPPLEMENT No. 1**

**EUREKA PEAK AND RELATED FAULTS**  
San Bernardino and Riverside Counties, California

by  
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May 20, 1993

**INTRODUCTION**

The Eureka Peak fault as well as the Burnt Mountain fault and two lesser zones of surface rupture were discovered and mapped following the Landers Earthquake of June 28, 1992 (Treiman, 1992a). These faults have been described and Alquist-Priolo Special Studies Zones recommended by Treiman (1992b). The purpose of this supplement is to consider new data which has come to our attention since the release of the Preliminary Special Studies Zones maps on January 1, 1993. Additional rupture has been identified by geotechnical consultants and may warrant revision of the preliminary Special Studies Zones maps for the Yucca Valley North and Yucca Valley South quadrangles (CDMG, 1993a,b).

**NEW INFORMATION**

Mapping by Rasmussen & Associates (1993) within the Yucca Valley South quadrangle shows that rupture along the "cross fault" within section 7 (T1S,R6E) extended further north than previously recognized, extending beyond the proposed Special Studies Zone (CDMG, 1993). They mapped an additional 1200 feet of discontinuous right-stepping fractures (Figure 1). This fault zone was not visible in their trenches about 250' to the north. They have also observed a weakly defined zone of discontinuous fractures to the southeast, parallel to the Eureka Peak fault (Figure 1). They could not see any measurable offset. This 1000' long set of fractures lies entirely outside of the zone proposed on the Preliminary Special Studies Zone map (CDMG, 1993) and was not visible beyond the area noted. The longest of the 10 cracks depicted (Rasmussen & Associates, 1993) were less than 30 feet long and most were less than 20 feet long.

Additional observations by Rasmussen & Associates (1993) within the Yucca Valley North quadrangle, but south of the Pinto Mountain fault may also relate to the Eureka Peak fault zone. They report a broad zone of northwest-trending fractures with 1" to 2" of right-lateral offset near the northeast end of the Yucca Valley airport and an isolated zone of fractures near Highway 62 and Avalon Ave. (Figure 2). The data provided in the airport area appears to be diagrammatic and does not portray the actual ground fracture pattern in detail or extent. The Highway 62/Avalon locality consisted of a 20' to 40'-wide zone of left-stepping fractures with 1.5" to 2" of vertical separation, west side up, but no detectable lateral offset.

The following reference should be added to this FER: Matti & others, 1992. This reference (as well as an earlier version which it supersedes) shows four fault segments mapped at the western margin of the Yucca Valley South quadrangle. The faults were interpreted by John Matti based on aerial photo interpretation (J. Matti, personal communication, 1993). These inferred faults coincide with features identified in FER-230 (Treiman, 1992b, Figure 3a).

#### AERIAL PHOTO INTERPRETATION

The 1:6000 scale aerial photos, taken on 6/30/92 and 7/3/92, were re-examined under 30x magnification but no indication was seen of the reported fracturing outside the Special Studies Zone in the airport area or to the south in the SW¼ of section 8 (T1S, R6E). Some other possible ground cracks are visible in nearby areas but have not been otherwise reported and have not been verified in the field. None of the other additional fractures are within the range of the detailed post-earthquake aerial photo coverage.

#### **AERIAL PHOTOGRAPHS USED**

##### I.K.Curtis

Landers EQ	92-1178	9x9 B/W	1:6000
frames 2-10 to 2-11			9-30-92
Landers EQ	92-1226	9x9 B/W	1:6000
frames 24A-289 to 24A-291			7-3-92

#### FIELD OBSERVATIONS

No additional field observations were made, however the airport area was inspected following the earthquake. A zone of more intense cracking, generally only in well-compacted ground, was noted trending northwesterly north of the airport area, but was attributed to the higher shaking levels above the aftershock zone. Discontinuous extensional cracks trending N20°W were also noted south of the airfield, and may have had very minor left-lateral displacement. Other cracks in this area were subparallel to the wash margins and were not distinguishable from lurch cracks. Cracks at the northern end of the mapped Eureka Peak fault, north of Yucca Trail, showed no rejuvenation in mid-September, whereas afterslip was recorded farther south (Roger Bilham, personal communication). Likewise, the fractures near Avalon and Highway 62 showed no rejuvenation in September.

## DISCUSSION AND CONCLUSIONS

The fractures mapped north of the "cross fault" extend a well-defined structure that is characterized by broadly right-stepping *en echelon* fractures with minor but consistent left-lateral offset.

The fractures in the SW¼ of section 8, adjacent to the Eureka Peak fault Special Studies Zone, are not as continuous or as consistent as other features which have been zoned and are not prominent enough to be visible in post-earthquake aerial photography. There was no indication of displacement and they are not clearly defined as fault features.

The zone of cracks near Avalon and Highway 62 (Yucca Valley North quadrangle), is well defined. Although this short fracture set is isolated and is not clearly related to any of the better defined fault rupture, the distinct left-stepping pattern is strongly suggestive of right-lateral shear.

The cracks in the Yucca Valley airport area, although clearly related to the earthquake shaking, cannot be clearly identified as fault rupture. The features were scattered over a broad area (up to 1400' wide), were discontinuous and had no clear sense of displacement or pattern. Many of the interpreted or reported features have not been verified. Although some of the features may have been related to displacement at depth, other cracks were more clearly related to lurching. This area overlies the trend of the aftershock zone and the scattered ground-cracking was probably due to severe shaking of poorly consolidated sediments above this zone.

## RECOMMENDATIONS

The northern extension of the cross fault should be added to the Special Studies Zone map for the Yucca Valley South quadrangle and the zone should be modified as shown on Figure 3. The small fault zone near Avalon and Highway 62, on the Yucca Valley North quadrangle, should be included in a Special Studies Zone as indicated on Figure 4.

The other fractures noted (near the airport and in the SW¼ of section 8) should not be zoned at this time. They are not sufficiently identified with faulting such that they represent a clear risk of repeatable ground rupture.

Reviewed &  
recommendations  
approved  
Earl W. Hart  
5/26/93

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## REFERENCES

- CDMG, 1993a, State of California Special Studies Zones, Yucca Valley North Quadrangle, Preliminary Review Map of January 1, 1993: California Department of Conservation, Division of Mines and Geology, 1:24,000.
- CDMG, 1993b, State of California Special Studies Zones, Yucca Valley South Quadrangle, Preliminary Review Map of January 1, 1993: California Department of Conservation, Division of Mines and Geology, 1:24,000.
- Matti, J.C., Morton, D.M., and Cox, B.F., 1992, The San Andreas fault system in the vicinity of the central Transverse Ranges Province, southern California: U.S. Geological Survey Open-File Report 92-354, 50p., map scale - 1:250,000.
- Rasmussen, G.A., and Associates, 1993, letter to Earl Hart/DMG re "Comments on proposed Alquist-Priolo Special Studies Zones in Landers area", March 29, 1993, 3p., enclosures.
- Treiman, J.A., 1992a, Eureka Peak and Burnt Mountain faults, two "new" faults in Yucca Valley, San Bernardino County, California *in* Ebersold, D.B., ed., Landers earthquake of June 28, 1992, San Bernardino County, California, field trip guidebook: Southern California Section of the Association of Engineering Geologists, Annual Field Trip, October 10, 1992, p.19-22.
- Treiman, J.A., 1992b, Eureka Peak and related faults, San Bernardino and Riverside Counties, California: California Division of Mines and Geology Fault Evaluation Report FER-230 (unpublished).



Figure 1 (FER-230, supplement)

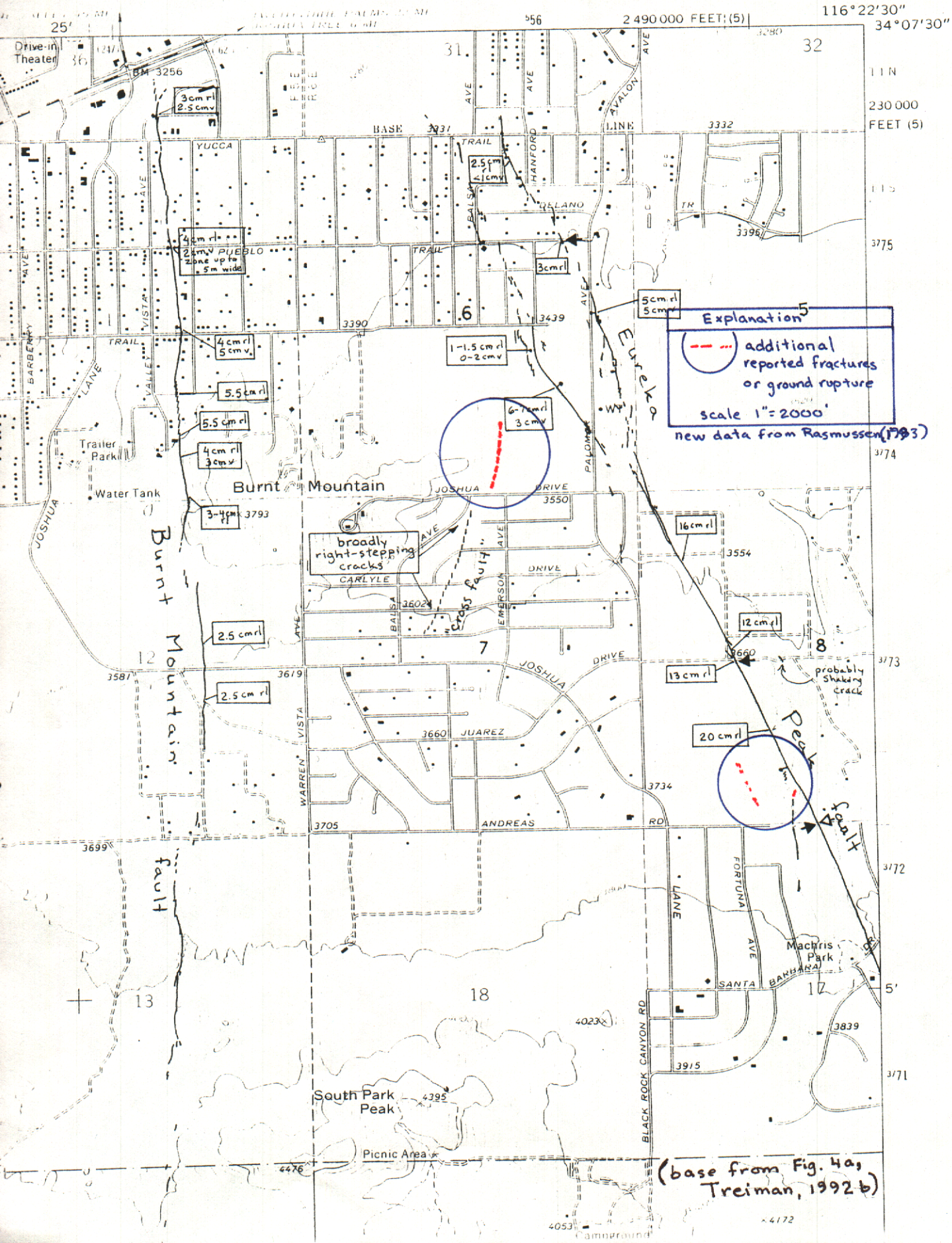
YUCCA VALLEY SOUTH QUADRANGLE

CALIFORNIA

7.5 MINUTE SERIES (TOPOGRAPHIC)


SW/4 JOSHUA TREE 15' QUADRANGLE

2752 III NE  
JOSHUA TREE NO





additional  
ground cracks  
reported by  
Rasmussen (1993)

 zone of ground cracks observed after earthquake.

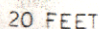




Figure 3 (FER-230, supplement)

Recommended changes  
to proposed Special Studies  
Zones.

YUCCA VALLEY SOUTH QUADRANGLE  
CALIFORNIA  
7.5 MINUTE SERIES (TOPOGRAPHIC)

SW 1/4 JOSHUA TREE 15 QUADRANGLE

ERNE VALLEY 45 MI. 25' TWENTYNINE PALMS 22 MI JOSHUA TREE 6 MI 2490000 FEET (5) 116°22' 34°07'30"

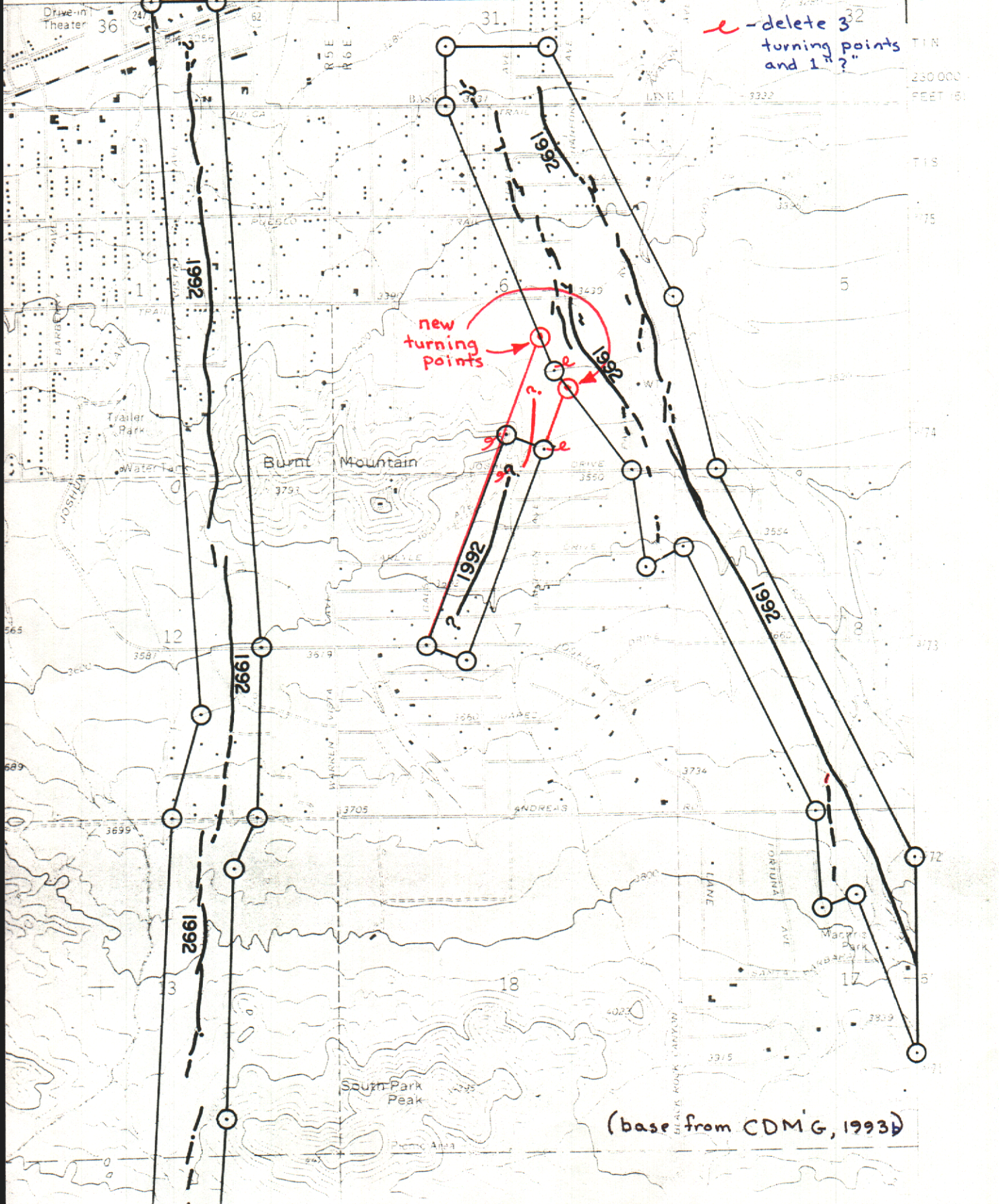
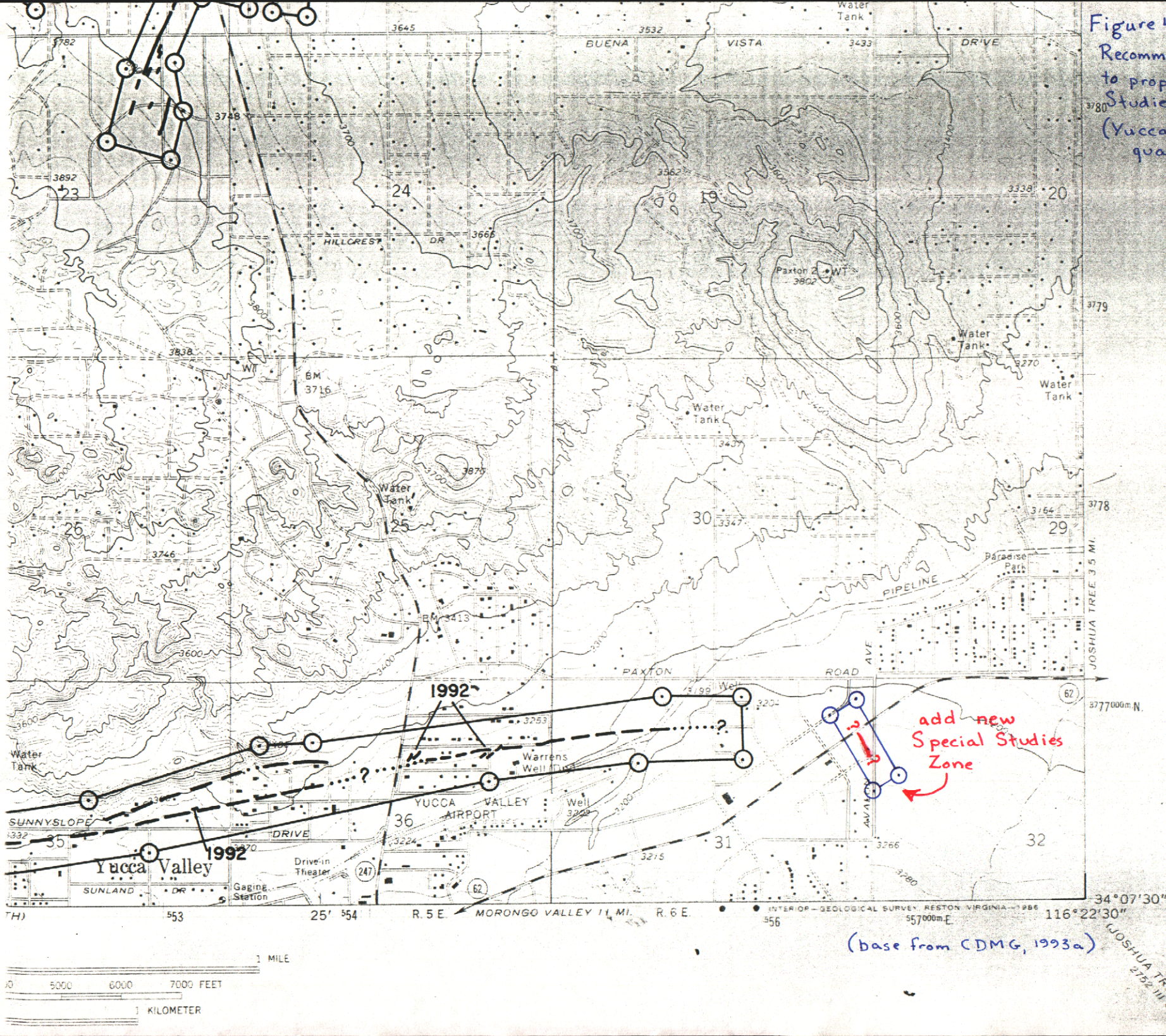




Figure 4 (FER-230, suppl.)  
 Recommended changes  
 to proposed Special  
 Studies Zones.  
 (Yucca Valley North  
 quadrangle)



(base from CDMG, 1993a)